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To help tap into the technologies you may be aware of that can address NASA's technology needs, NTB features NASA TechNeeds, a series of articles that highlights the technology needs of the Agency. (A detailed overview of NASA's tech needs areas is available at: www.techbriefs.com/nasatechneeds.) The objective is to provide awareness of NASA's future needs and requirements, which could facilitate potential future partnerships.

Each article describes specific selected technologies of importance. In every case, a NASA point of contact will be provided so that those interested have the means to explore the potential for partnerships with NASA.

NASA wants to make NTB a means by which we can achieve mutually beneficial two-way technology transfer, building on the track record of success that NTB has achieved in transferring NASA technology for commercial development and public benefit.

Purge Monitoring Technology for Gaseous Helium (GHe) Conservation

By Jonathan Dickey & John Lansaw, Stennis Space Center, Mississippi

John C. Stennis Space Center provides rocket engine propulsion testing for the NASA space programs. Since the development of the Space Shuttle, every Space Shuttle Main Engine (SSME) has gone through acceptance testing before going to Kennedy Space Center for integration into the Space Shuttle. The SSME is a large cryogenic rocket engine that uses Liquid Oxygen (LO2) and Liquid Hydrogen (LH2) as propellants. Due to the extremely cold cryogenic conditions of this environment, an inert gas, helium, is used as a purge for the engine and propellant lines since it can be used without freezing in the cryogenic environment.

As NASA moves forward with the development of the new ARES V launch system, the main engines as well as the upper stage engine will use cryogenic propellants and will require gaseous helium during the development testing of each of these engines. The main engine for the ARES V will be similar in size to the SSME.

Space Shuttle Main Engine (SSME)

Technology Needs

Due to the size of the SSME and the test facilities required to test the engine, extremely large quantities of helium are used during testing each year. This requirement makes Stennis one of the world's largest users of gaseous helium, which is a non-renewable natural resource. The cost of helium is increasing as the supply diminishes, and it is beginning to impact testing of the rocket engines for space propulsion systems.

Innovative solutions are needed for efficient and cost-effective methods to measure hydrogen concentrations in a helium background during the engine purging and testing processes. By better understanding when the purging process is complete, helium gas usage can be reduced significantly. Research into technologies in these areas, demonstration of the technology capability, and conceptual design for the technology installation at Stennis are desired to assist in helium use reduction.

Technology Challenges

Helium is used in piping and engine purge processes to inert liquid hydrogen systems. Because of this, hydrogen-in-

High Pressure Gas Facility (HPGF) – GN, GHe, GH, Air

helium concentration devices must stand up to this severe cryogenic temperature condition. One of the challenges will be to develop a measurement device that detects small amounts of hydrogen in a helium background while surviving in this environment. In order to allow more and faster data to be collected from the device, another challenge will be the development of a system that can be used to detect hydrogen in a helium background continuously without the use of a vacuum system to test a small sample.

The technologies developed to detect hydrogen concentrations in a helium background must be cost effective and able to perform in a cryogenic temperature environment. Such technologies will be required to comply with all safety and quality standards required in this environment.

More Information

For additional information, or to discuss ideas about this, contact John Lansaw at 228-688-1962 or john.lansaw-1@nasa.gov, or visit nasa@techbriefs.com.